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Forty-two college undergraduates, 28 women and 14 men, were classified as analytic, categorical, or relational according to their responses on the Sigel Cognitive Style Test and were randomly assigned to verbal or pictorial conditions. The subjects were presented a series of slides involving the paired association of 9 three-letter nonsense syllables (Glaze List) with 36 single words or pictures representing three types of concepts. A two-way analysis of variance of mean errors failed to replicate the previous finding of an interaction between learner cognitive style and concept class for either stimulus condition. However, a significant main effect (p less than .01) on learner style for the verbal condition revealed that analytic subjects performed better across all concept classes than those having categorical or relational styles. Tables and references are included. (Author/RT)

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THE EFFECT OF COGNITIVE STYLE IN VERBAL AND PICTORIAL CONCEPT FORMATION TASKS

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The Effect of Cognitive Style in Verbal and Pictorial Concept Formation Tasks

42 college undergraduates, 28 women and 14 men, were classified as analytic, categorical or relational according to their responses on the Sigel Cognitive Style Test and were randomly assigned to verbal or pictorial conditions. The Ss were presented a series of slides involving the paired association of 9 3-letter nonsense syllables (Glaze list) with 36 single words or pictures representing 3 types of concepts. A 2-way analysis of variance of mean errors failed to replicate the previous finding of an interaction between learner cognitive style and concept class for either stimulus condition. However, a significant main effect ($p < .01$) on learner style for the verbal condition revealed that analytic Ss performed better across all concept classes than those having categorical or relational styles.

The concept of cognitive style has acquired two relatively distinct meanings as it is used in the research literature. Witkin, et al. (1962) have operationalized the concept in terms of performance on a perceptual task, such as the Embedded Figures Test, in which persons are characterized as having a relatively "analytic" or "global" perceptual orientation. Kagan, Moss and Sigel (1963) have defined cognitive style in terms of the individual's preference for grouping pictorial stimuli according to descriptive, categorical-inferential or relational-contextual criteria. Some studies have characterized responses involving descriptive part-whole criteria as "analytic" and those involving any of the

remaining criteria, including descriptive-global responses, as "nonanalytic."

Both of the above approaches to cognitive style have involved the assumption that such style variables represent relatively stable modes of cognitive functioning (Davis, 1968; Kagan, Moss & Sigel, 1963). This assumption has led researchers in the area to investigate the relationship between cognitive style and numerous other personality and intellectual factors. Davis (1968), for example, found that persons characterized as high analytic according to the Hidden Figures Test performed significantly better on a concept identification task than those who were described as having a low analytic style. Similar results were obtained by Elkind, Koegler and Go (1963) who employed the Embedded Figures Test as the measure of cognitive style. In another study, Lee, Kagan and Rabson (1963) used the Conceptual Style Test (Kagan, Moss & Sigel, 1963) to investigate the effect of cognitive style on concept acquisition involving pictorial stimuli. They found that analytic boys were superior at learning analytic concepts, while nonanalytic boys performed significantly better with the relational concepts.

The results of the Lee, Kagan and Rabson study suggest a further theoretical issue with respect to the generality and pervasiveness of cognitive style in the area of concept learning. In particular, it is of

theoretical interest to determine the effect of cognitive style on concept acquisition when the learning task involves verbal rather than pictorial stimulus dimensions. Thus, the aim of the present study was to investigate the influence of cognitive style on concept attainment when the learning task was varied according to conceptual class (analytic, categorical and relational concepts) and stimulus materials (verbal or pictorial). It was assumed that such an investigation would provide evidence relating to the validity extension of cognitive style variables in the area of concept learning.

METHOD

Subjects. Forty-two undergraduates from Indiana University, 28 women and 14 men, were selected from a group of 58 student volunteers according to their responses on the Sigel Cognitive Style Test (SCST). The Ss were categorized into three groups of 14 each in terms of their predominant cognitive style---analytic, categorical or relational. All Ss participated in the concept attainment experiment within three weeks after the SCST was given.

Learning Materials. Two sets of 35 mm slides---one verbal and one pictorial---were prepared for use in the concept attainment experiment. Each set of slides included three types of concepts---analytic, categorical

and relational---and three different stimulus concepts for each conceptual class. Four positive instances for each of the nine concepts were represented by 36 single words in the verbal set and 36 photographs in the pictorial set. Each set of slides also included four duplicates of nine three-letter nonsense syllables (Glaze list; Hilgard, 1951) which were used in association with the appropriate concept instances. Table 1 illustrates some of the stimulus concepts and nonsense syllables which were included in the pictorial and verbal slides.

Table 1

Stimulus Concepts and
Paired Nonsense Syllables

Conceptual Class	Stimulus Concept	Nonsense Syllable
Analytic.....	Pictures containing eye glasses	LUB
	Words ending in "ate"	LUB
Categorical....	Pictures of sporting events	RUK
	Names of different weapons	RUK
Relational.....	Pictures related to religion	TUD
	Words related to football games	TUD

Procedure and Experimental Design. The 14 Ss in each cognitive style category were randomly assigned to verbal and pictorial conditions. Each S was asked to memorize a list of the nine nonsense syllables prior to the presentation of instructions. The syllables were randomized in nine different sequences (lists) which were randomly assigned to Ss.

All Ss received standard paired-associate learning instructions. In addition, the Ss were informed that the words or pictures to be associated with each syllable could be grouped according to analytic, categorical or relational criteria. The Ss were also instructed to respond to every stimulus instance (word or picture) which was presented.

Each set of slides was presented on a Carousel 800 projector at a 5:5-sec. rate. The 36 stimulus instances for each condition were randomized in four different sequences with the restriction that each sequence contain only one instance of each concept. Since each sequence was defined as a trial, the complete set of stimulus instances was presented in four trials. The four sequences were presented in an unchanging order with a 10-sec. interval between sequences until each S completed 12 trials. All Ss received a random starting order (sequence number) and learned by the anticipation method.

RESULTS AND DISCUSSION

The number of errors over the last four trials was determined for each S for each of the three conceptual classes. The mean number of errors for the Ss in each learner style category according to conceptual class is shown in Table 2.

Table 2

Mean Errors for Trials 9-12

Groups	Conceptual Classes		
	Analytic	Categorical	Relational
Verbal Condition			
Analytic.....	4.7	0.7	1.0
Categorical...	6.7	1.3	2.0
Relational....	5.7	1.9	2.9
Pictorial Condition			
Analytic.....	2.9	0.4	0.7
Categorical...	3.6	1.0	1.9
Relational....	2.7	1.0	1.6

The summary of an analysis of variance for the verbal and pictorial conditions appears in Table 3. A significant main effect was found on learner cognitive style for the verbal condition. It revealed that analytic Ss

Table 3

Analysis of Variance of
Mean Errors (Trials 9-12) for
Verbal and Pictorial Conditions

Source	df	MS	F
Verbal Condition			
Learner Style (A)	2	11.25	5.65*
Concept Class (B)	2	119.73	60.10**
A X B	4	2.04	1.02
Pictorial Condition			
Learner Style (A)	2	3.44	2.58
Concept Class (B)	2	28.40	21.30**
A X B	4	0.63	0.48

*$p < .01$
**$p < .001$

performed better across all conceptual classes than Ss with categorical or relational styles. A main effect on conceptual class for both the verbal and pictorial conditions was also significant. The data indicated a much higher difficulty level for the learning of analytic concepts in comparison with concepts of the categorical and relational type. This difference held for all learner styles and for both verbal and pictorial stimuli. The results failed to show a significant interaction between learner style and conceptual class for either condition.

It thus appears that the Ss in each style category had no differential advantage in learning concepts appropriate to their particular cognitive style, regardless of the stimulus dimensions.

The failure of this study to replicate the earlier finding (Lee, Kagan & Rabson, 1963) of an interaction between cognitive style and conceptual class for pictorial stimuli may be due to any of several factors. It is likely, however, that the difference in age between the subject populations of the two experiments is of crucial importance. From a Piagetian standpoint, it is possible to conceptualize the third grader as having a particular schema (cognitive style) which is pronounced in development but still lacking in proper differentiation-recognition (Flavell, 1963). Such a child may tend to employ the developed schema in a rather compulsive---i.e., repetitive---manner and thus fail to accommodate quickly to those learning tasks which require the use of another schema. In contrast, it may be hypothesized that the college student has developed flexible and well-differentiated schemas which are representative of all three types of cognitive style. Thus, the preference for a particular schema (style) at this age level is not associated with the kind of differential effects on concept attainment that have been found for young children.

Despite the above interpretation, the ability of college students to learn different types of concepts does not appear to be independent of style preference. This study revealed that analytic students performed best in learning all three kinds of concepts when the stimulus dimensions were verbal. For some reason, an analytic style preference is associated with superior performance in verbal concept formation tasks, even when the concept class does not involve a descriptive part-whole similarity. The various factors which relate to the conceptual superiority of an analytic style in college students, as well as the developmental issues raised above, are matters which deserve further investigation.

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